

The Development of PAPI OPUNG Media to Improve Children's Logical-Mathematics Intelligence

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THE DEVELOPMENT OF *PAPI OPUNG* MEDIA TO IMPROVE CHILDREN'S LOGICAL-MATHEMATICS INTELLIGENCE

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Abstract

This research is conducted to develop a product in the form of learning media which is called as Papi Opung to improving logical-mathematics intelligence in early childhood. Moreover, the method used in this research was the research and development (R&D) model from Borg and Gall. Furthermore, we use 6 stages of the existing 10 stages. These stages consist of: (1) potential and problem analysis, (2) literature study, (3) product design, (4) design validation, (5) design revision, and (6) product trial. Data analysis was conducted descriptively quantitatively. In addition, data were obtained from instrument assessments in the form of validation sheets for media experts and material experts, validation sheets for convenience and attractiveness by teachers group B, observation sheets in small group trials and observation sheets in field trials. The results of the study show that papi opung media are relevant, feasible, and valid for increasing logical-mathematics intelligence in early childhood.

Keywords: *Papi Opung Media; Logical-Mathematics; Early Childhood.*

Abstrak

Penelitian ini dilakukan untuk mengembangkan suatu produk berupa media pembelajaran yang disebut Papi Opung untuk meningkatkan kecerdasan logika-matematika pada anak usia dini. Selain itu, metode yang digunakan dalam penelitian ini adalah model penelitian dan pengembangan (R&D) dari Borg and Gall. Selanjutnya kami menggunakan 6 tahapan dari 10 tahapan yang ada. Tahapan tersebut terdiri dari: (1) analisis potensi dan masalah, (2) studi literatur, (3) desain produk, (4) validasi desain, (5) revisi desain, dan (6) uji coba produk. Analisis data dilakukan secara deskriptif kuantitatif. Selain itu, data diperoleh dari penilaian instrumen berupa lembar validasi ahli media dan ahli materi, lembar validasi kemudaban dan daya tarik guru kelompok B, lembar observasi uji coba kelompok kecil dan lembar observasi uji coba lapangan. Hasil penelitian menunjukkan bahwa media papi opung relevan, layak, dan valid untuk meningkatkan kecerdasan logika-matematika pada anak usia dini.

Kata Kunci: *Media Papi Opung; Logika-Matematika; Anak Usia Dini.*

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INTRODUCTION

Early childhood is the 0-6 year age group which is experiencing significant growth and development (Nirawati & Yetti, 2019). Early age is a potential period for children to develop. The development of the central nervous system in early childhood occurs rapidly so that it is often called as the golden age (Novitasari, 2018). It is important for children to get the right stimulation at their golden age so that all aspects of development can develop optimally. Therefore, children should have supportive environment for their developmental stimulus (Novitasari, 2017). In addition to the five aspects of development in children, which are religious and moral values, cognitive, physical motor, language, and social and emotional, intelligence is an important thing to be developed in children in their golden age. Intelligence is the ability to solve problems and create a product of value in a culture (Suarca et al., 2016).

There are nine kinds of intelligence possessed by children, which are linguistic intelligence, visual-spatial intelligence, logical-mathematics intelligence, naturalist intelligence, musical intelligence, extensional intelligence, kinesthetic intelligence, interpersonal intelligence and intrapersonal intelligence (Syarifah, 2019). Furthermore, intelligence is the ability to adapt oneself to produce an idea as a solution to the problems faced in daily life (Tabi'in, 2017). Meanwhile, Rozi (2012) stated that intelligence is the expression of children's thoughts as a provision in learning. Proper stimulation of children's intelligence development will have a significant impact on individual children and their environment.

Logical-mathematics intelligence is very important to be developed in early childhood since it is related to classification, systematic thinking, causal relationships, and counting (Mufarizuddin, 2017). Furthermore, children who have logical-mathematics intelligence will have superior abilities in reasoning using logic, skills, mathematical operations, and critical thinking. It is in line with the statement of Lestaringrum and Handini (2017) that children who have good logical-mathematics intelligence are able to solve all the problems they are facing. Moreover, the development of logical-mathematics intelligence in early childhood can help them to the next level of education; besides, support the development of cognitive aspects in children. Thus, it is important to develop logical-mathematics intelligence in early childhood.

Based on the explanation above, we conducted observations and interviews with children of group B at Dharma Wanita Pelas Kindergarten with a total of 20 students which consists of 8 boys and 13 girls. Based on observations, it can be seen that logical-mathematics intelligence in students has not developed optimally. The obstacles experienced by students are that they still have difficulty in sorting the smallest size to the largest size, determining more or less, counting the number and finding solutions to simple problems given by the teacher. On the other hand, there are still many students who feel confused in counting so that they need help from the teacher. Furthermore, the results of the interviews which we conducted show that the activities provided at Dharma Wanita Pelas Kindergarten still used a lot of children's activity sheets (LKA). In the end it makes learning monotonous; besides, it makes children get bored easily and less interested in the activities provided by the teacher. Therefore, logical-mathematics intelligence in children has not developed as expected. The low development of logical-mathematics intelligence possessed by children can inhibit the development of creativity, imagination, reasoning, and critical thinking skills in children. In addition to monotonous learning, the limited use of learning media in the form of educational game tools is also an inhibiting factor in the development of logical-mathematics intelligence in children.

The development of logical-mathematics intelligence by using the media of children's activity sheets seems stiff and less fun so that it does not give children the opportunity to explore the concrete environment around them and children become passive learners (Marli'ah, 2019). It is of course not in accordance with the principle of learning in PAUD that is playing while learning (Aisyah et al., 2019). In line with what had stated by Trisniawati et al. (2018) that the main part of learning in early childhood is playing. It is in accordance with the characteristics of children which makes play activities are preferred by children. Children will be happier so that learning is more optimal when conducted through play activities (Dwiyanti et al., 2018). Playing can help children understand the world (Suryaningsih & Rimpiati, 2018). In addition, playing activities using tools

which contain educational value will make children show their cognitive abilities (Muloke et al., 2017).

Logical-mathematics intelligence is closely related to children's daily life. Logical thinking patterns and critical thinking can be formed through the development of logical-mathematics intelligence. Furthermore, logical-mathematics intelligence is a pattern of developing logical and natural thinking in understanding numbers, through logical thinking children are able to solve the problems they face (Rahmalia & Suryana, 2021). Logical-mathematics intelligence is the ability to think logically, understand, and process numbers in mathematics. People with good logical-mathematics intelligence are sensitive to abstractions, functions, proportions, and logical pattern relationships (Suripatty et al., 2019). Moreover, mathematics is not only about counting and memorizing formulas, but it is also coordination between the mind and the senses to find a new concept in modifying knowledge (Hasanah & Agung, 2018). Counting is a part of mathematics, the ability to count in Early Childhood Education does not focus on cognitive, but also social-emotional and mental readiness (Nirawati & Yetti, 2019).

Enjoyment of mathematics needs to be development from an early age, introducing mathematics to children through play will be more fun so that children will not see mathematics as something scary (Wati & Wulansari, 2021). Furthermore, the use of learning media in learning mathematics will be easily understood by children's understanding which is simple and fun for children (Setiawan, 2018). Learning media is anything that can be used to deliver messages so that they are able to stimulate interest, attention, feelings and thoughts in order to achieve learning goals (Anggara et al., 2018). Meanwhile, the functions of learning media according to Suryani in (Widiana et al., 2019) are as follows; (1) supporting conducive learning, (2) as a part of the overall learning process, (3) building concrete basic concepts to reduce memorization, (4) building encouragement of children's learning, (5) improving the quality of learning.

One of the media which can be used to stimulate the development of logical-mathematics intelligence is an educational game tool in the form of a pegboard. Moreover, educational game tools are media designed to stimulate and increase children's potential to achieve learning goals (Mulyana et al., 2017). According to Guslinda and Kurnia as quoted by Nityanasari (2020), the characteristics of a good educational game tool are as follows; (1) intended for early childhood, (2) to stimulate aspects of child development, (3) have multipurpose functions, (4) to strengthen creativity and activity in children, (5) it is not harmful to children, (6) build children's knowledge, (7) there is an element of education.

The pegboard media is an educational game tool in the form of a wooden box with a hole at the top while a number symbol on the front; besides, it is equipped with a peg that will be inserted into the hole in the box (Respita et al., 2020). The pegboard is very simple to be used by children. They are asked to match the pegs with the numbers on the front of the box. In addition to introducing numbers to children, pegboard media can be used to encourage children to recognize colors, which can be modified according to the needs of developmental aspects in children (Nityanasari, 2020).

The study which had conducted by Andarwati (2021) shows that the use of pegboard media is able to increase activity, independence, courage and learning outcomes in early childhood. Furthermore, Respita et al. (2020) stated that the pegboard game is practical, easy to use and easy to understand for children to learn to recognize number symbols. In addition, based on the results of observations and previous research studies, we decided to develop an innovative media as a modification of the pegboard game which called as *Papi Opung*. It aims to improve logical-mathematics intelligence in early childhood.

The uniqueness of *Papi Opung* media compared to pegboard game is that in pegboard game children are only asked to match colors while if it is combined with *Papi Opung* media, children will be introduced arithmetic operations; such as, addition, subtraction, with more, less, and the same number of categories. The material which will be used in the manufacture of this media is plywood board with the consideration that the material is quite affordable and of course safe for children. In addition, this media is in the form of a board which is given several hooks and a set of types of fruit. *Papi Opung* media is a game which can be played individually or in groups; besides, it aims to

increase logical-mathematics intelligence in early childhood. The use of *Papi Opung* media is an effort to create more active, fun, and meaningful learning for children.

METHODOLOGY

This study used the method of development or Research and Development (R&D). Development research is research which aims to produce and test the effectiveness of a product. Moreover, the model used by the researcher was the Borg & Gall development model which consisted of 10 stages; however, in this study the researcher only used 6 stages. The 6 stages of development were (1) analysis of potential problems, (2) literature study, (3) product design, (4) design validation, (5) design revision, and the last (6) product trial. The following is a development model scheme adapted from the Borg & Gall model which will be used in this study (Sugiyono, 2017).

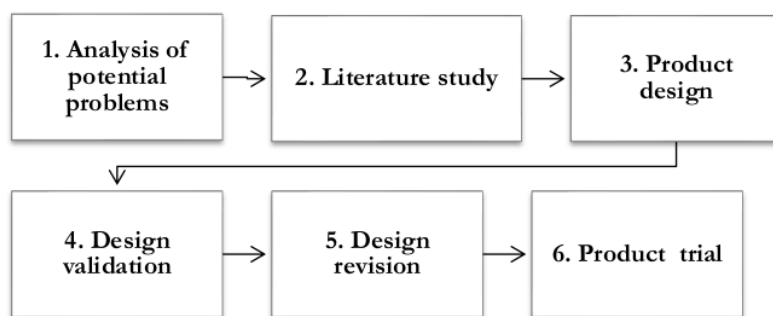


Figure 1. Stages of *Papi Opung* Media Design

The overall test subjects were 15 students of group B at Dharma Wanita Pelas Kindergarten. In the small group trial, there were 5 children and 10 children in the large group trial. The trial was conducted on a limited basis due to the pandemic and limited face-to-face implementation. Furthermore, the data collection instruments used by the researchers were in the form of a validation questionnaire for media experts and material experts, a questionnaire validation of convenience and attractiveness by teachers of group B at Dharma Wanita Pelas Kindergarten, and observation sheets. Then, Media which had been validated by media experts and the material are tested. In addition, the data analysis technique obtained from the media expert and material expert validation questionnaire was processed using the Aiken formula in order to determine the validity of the product developed using quantitative descriptive analysis.

RESULTS AND DISCUSSION

The assessment of the product or media developed by the researcher is conducted by 2 media experts. The aspects assessed are as follows: (1) the safety of the materials used; (2) the durability of *Papi Opung* media (papan pintar operasi hitung) materials; (3) the suitability of *Papi Opung* media size for children; (4) attractiveness of media design; (5) the suitability of fruit images with colors; (6) the suitability of the images with the material and characteristics of the child; (7) color suitability with the child's characteristics; (8) suitability of color composition, images and text; (9) suitability of fruit size; (10) the suitability of the fruit color used; (11) clarity of color on the fruit; (12) the suitability of games using *Papi Opung* media with children's characteristics; (13) the practicality of the media which is easy to store and move; and the last (14) the accuracy of the media in developing children's abilities. The results of the media expert validation are as follows;

Table 1. Media Expert Validation Results

| Items | V (Aiken's Value) | Results |
|---------|-------------------|---------|
| Item 1 | 0.5 | Valid |
| Item 2 | 0.83 | Valid |
| Item 3 | 0.83 | Valid |
| Item 4 | 1 | Valid |
| Item 5 | 0.83 | Valid |
| Item 6 | 0.83 | Valid |
| Item 7 | 1 | Valid |
| Item 8 | 0.67 | Valid |
| Item 9 | 0.67 | Valid |
| Item 10 | 0.83 | Valid |
| Item 11 | 0.83 | Valid |
| Item 12 | 0.83 | Valid |
| Item 13 | 0.83 | Valid |
| Item 14 | 0.83 | Valid |

Based on table 1, it can be seen that the assessment of *Papi Opung* media shows valid values on all aspects contained in the description. Therefore, based on the results of media validation, it can be seen that the *Papi Opung* media is in accordance with the function of learning media. It shows that *Papi Opung* media is feasible to be tested. Furthermore, the assessment of the material on *Papi Opung* media is conducted by 2 material experts. The aspects assessed are as follows; (1) the suitability of the learning objectives of increasing children's logical-mathematics intelligence; (2) conformity of the material with core competencies and basic competencies; (3) suitability of addition and subtraction material; (4) the suitability of the material of more than— less than; (5) the suitability of the presentation of the material with the characteristics of early childhood; (6) the suitability of the material with the child's level of understanding; (7) the attractiveness of the material presented; (8) the attractiveness of *Papi Opung* media; (9) the presentation of the material can encourage interest in learning and children's curiosity; (10) media is able to help children learn critical thinking skills through playing; (11) presentation of material can improve color recognition; and (12) the ease of understanding the material by children using *Papi Opung* media. The results of material expert validation are presented in the following table;

Table 2. Material Expert Validation Results

| Items | V (Aiken's Value) | Results |
|---------|-------------------|---------|
| Item 1 | 0.83 | Valid |
| Item 2 | 1 | Valid |
| Item 3 | 0.5 | Valid |
| Item 4 | 0.5 | Valid |
| Item 5 | 0.83 | Valid |
| Item 6 | 0.83 | Valid |
| Item 7 | 0.67 | Valid |
| Item 8 | 0.83 | Valid |
| Item 9 | 0.83 | Valid |
| Item 10 | 0.83 | Valid |
| Item 11 | 0.67 | Valid |
| Item 12 | 0.83 | Valid |

The assessment which has been conducted by material experts on *Papi Opung* media is shown in table 2. It shows valid values in all aspects of the assessment. Based on these results, it can be seen that there is a match between the material on *Papi Opung* media and the aspect of stimulating children's logical-mathematics intelligence. In addition, these results indicate that the *Papi Opung* media is feasible to be tested.

The results of the validation assessment analysis of teachers of group B at Dharma Wanita Pelas Kindergarten showed a number of 90%. The aspects assessed by the teacher of group B are 5 aspects of convenience and 5 aspects of attractiveness, with the following details; (1) the ease of use of *Papi Opung* media for learning activities; (2) the ease of children in using the media; (3) the ease of children in learning the material presented; (4) the ease of use of media in helping children count; (5) the ease of learning evaluation; (6) attractiveness of media for children when using media; (7) the attractiveness of media visualization; (8) the attractiveness of presenting the material in the media; (9) the attractiveness of color selection; and the last (10) the overall attractiveness of the media. These results can be concluded that *Papi Opung* media is quite easy and interesting to shape learning in the classroom; especially, in increasing logical mathematics intelligence in early childhood.

After being assessed by media experts, material experts and group B teachers, and an analysis is conducted on the results of the *Papi Opung* media assessment which has met the requirements, then a trial is conducted. Aspects observed in the trial are aspects of convenience and attractiveness. There are 5 points of statement on the aspect of convenience, which are: (1) the convenience of *Papi Opung* media; (2) the ease of use of media for children; (3) the ease of children in understanding the material presented; 4) the ease of use of media to help children count; and (5) the ease of the learning evaluation. Meanwhile, there are 5 statement items on the attractiveness aspect, which are: (1) the attractiveness of media for children when using media; (2) the attractiveness of media visualization; (3) the attractiveness of presenting the material on the media; (4) the attractiveness of color in the media; and (5) overall attractiveness.

The first trial is conducted in a small group of 5 children. The results of the small group trial is on the aspect of convenience, as many as 5 children show attitude in accordance with item 1; 5 children show attitude in accordance with item 2; 3 children show attitude in accordance with item 3; 3 children show attitude in accordance with item 4; and 5 children show attitude in accordance with item 5. Meanwhile, in the aspect of attractiveness, 5 children show attitude in accordance with item 1; 4 children show attitude in accordance with item 2; 4 children show attitude in accordance with item 3; 5 children show attitude in accordance with item 4; and 5 children show attitude in accordance with item 5.

The second trial is conducted on a large group of 10 children. The results of the large group trial on the aspect of convenience are as follows; there are 10 children who show attitude in accordance with item 1; 10 children show attitude in accordance with item 2; 6 children show attitude in accordance with item 3; 10 children show attitude in accordance with item 4; and 10 children show attitude in accordance with item 5. In addition, in the aspect of attractiveness, the results are as follows; 10 children show attitude in accordance with item 1; 8 children show attitude in accordance with item 2; 8 children show attitude in accordance with item 3; 10 children show attitude in accordance with item 4; and 10 children show attitude in accordance with item 5.

After taking data through validation tests of media experts and material experts, teacher assessments of group B, small group trials and large group trials, it can be seen that *Papi Opung* media is suitable to use in learning. *Papi Opung* is a modified media pegboard made of plywood equipped with hooks (pegs) to hook fruit pawns. In this study, we use the theme of plants, so that we use fruits as pawns to be hooked to the main board. However, *Papi Opung* media can be used according to the theme of learning, not only limited to the plant theme. The use of *Papi Opung* media is played in groups.

Papi opung media as an innovative medium and modification of the pegboard has several advantages compared to the study on the development of the pegboard which conducted by Respita, et al (2020) and Andarwati (2021). The advantages of the media are: (1) learning activities are more innovative; (2) children are required to be active in learning so that learning becomes

more interactive; (3) helps to visualize material which is difficult to explain verbally; (4) increase children's motivation and excitement during the learning process so that learning objectives can be achieved optimally; and (5) the media is easy to use and apply as needed. It is in line with the statement of Patria & Iriyanto (2014) that children's enthusiasm and interest in learning activities which are in accordance with children's abilities and interests can be raised through the use of learning media. In addition, Azhima et al. (2021) stated that the use of learning media makes it easier for children to understand the learning context; besides, makes children more interested in participating in the learning process.



Figure 2. *Papi Opung* Media



Figure 3. *Papi Opung* Media

CONCLUSION

Logical-mathematics intelligence is an important aspect and should be developed from an early age since it can help children to have good life skills. Our effort in helping teachers to improve logical mathematics intelligence is that by developing *Papi Opung* learning media. The *papi opung* media which we have developed have been validated by media experts, material experts and the

assessment of teachers of group B at Dharma Wanita Pelas Kindergarten that is declared feasible and valid to be tested. The results of trials conducted in small groups and large groups stated that *papi opung* media is effective in increasing Logical-mathematics intelligence in children.

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PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9
